

8. The method of claim 1, wherein said increasing a sampling rate for sampling analog monitoring signals from monitoring of said power distribution system further comprises taking every other sample from a particular line of said power distribution system .

9. The method of claim 8, further comprising sampling said monitoring signals by multiplexing said monitoring signals to an analog-to-digital converter; wherein said increasing said sampling rate comprises controlling multiplexing of said monitoring signals to provide a single monitoring signal to said analog-to-digital converter for an extended time such that a sampling rate for that monitoring signal is increased high enough to capture high-speed transients in that monitoring signal.

10. The method of claim 1, wherein said increasing said sampling rate further comprises controlling a sampling rate of one or more analog-to-digital converters, where each of said one or more analog-to-digital converters has a variable sample rate.

11. A system for monitoring a power distribution line, said system comprising:  
connections for individual lines in said power distribution line for providing monitoring signals indicative of current and voltage within the lines of said power distribution line;

at least one analog-to-digital converter for sampling said monitoring signals, said converter sampling a monitoring signal fast enough to capture high-speed transients.

12. The system of claim 11, further comprising:  
a multiplexer for multiplexing said monitoring signals to said analog-to-digital converter; and  
a processor controlling said multiplexer, wherein said processor causes said multiplexer to provide a particular monitoring signal to said analog-to-digital converter long enough for said analog-to-digital converter to capture high-speed transients in said particular monitoring signal.

13. The system of claim 12, further comprising a user input device connected to said processor, wherein said processor controls said multiplexer in accordance with user input from said user input device.

14. The system of claim 11, wherein:

said at least one analog-to-digital converter comprises an array of analog-to-digital converters, each receiving a particular monitoring signal; said analog-to-digital converters each having a variable sampling rate; and

said system further comprises a processor for controlling a sampling rate of said analog-to-digital converters to at least periodically increase said sampling rate enough to capture high-speed transients.

15. The system of claim 14, further comprising a user input device connected to said processor, wherein said processor controls said array of analog-to-digital converters in accordance with user input from said user input device.

16. The system of claim 11, further comprising an interrupt device for selectively halting power flow in said power distribution system.

17. A system for monitoring a power distribution system, said system comprising:  
sampling means for sampling analog monitoring signals from monitoring of said power distribution system; and

means for selectively increasing a sampling rate of said sampling means until said sampling rate is high enough to capture high-speed transients.

18. The system of claim 17, further comprising:

means for storing sampled data from said monitoring signals in a memory unit; and  
means for analyzing said stored data with a processor.

19. The system of claim 17, further comprising means for interrupting a flow of power on said power distribution system if analysis of said stored data indicates a danger according to pre-defined parameters.

20. The system of claim 17, further comprising user input means for controlling said means for increasing said sampling rate.

21. The system of claim 17, wherein said sampling means further comprise means for multiplexing said monitoring signals to an analog-to-digital converter.

22. The system of claim 21, wherein said means for multiplexing said monitoring signals are controlled by control means to provide a single monitoring signal to said analog-to-digital converter for an extended time such that a sampling rate for that monitoring signal is increased high enough to capture high-speed transients in that monitoring signal.

23. The system of claim 17, wherein said means for increasing said sampling rate further comprises means for controlling a sampling rate of one or more analog-to-digital converters receiving said monitoring signals, where each of said one or more analog-to-digital converters has a variable sample rate.